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ABSTRACT

Expectancy theory and decision theory research predicting occupational preference and choice were reviewed to assess the usefulness of such approaches. Each investigation produced substantial support for the use of such models suggesting that both theories can provide practical insights for occupational guidance and counseling. While theoretical, mathematical, and methodological differences exist among these approaches, they are based on a fairly similar, rational maximization principle. They assume that people will choose the occupations they believe will result in the greatest amount of benefit to them, provided there is a good chance they can actually attain a position in the occupation. The results of studies in occupational guidance and counseling are congruent with the foregoing. Providing people with accurate information about jobs and job outcomes facilitates adjustment and reduces turnover. The expectancy and expected value models provide solid, explicit ways in which people might use the information, their values, and expectations about the future in order to make the "best" possible choices; these models seem to be highly predictive. (TA)

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# EXPECTANCY THEORY, DECISION THEORY AND OCCUPATIONAL PREFERENCE AND CHOICE

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Exepctancy Theory and Decision Theory research predicting occupational preference and choice is reviewed. The results provide strong support for both approaches. Applications of Decision Theory models to problems of occupational selection are also discussed. A summary perspective suggests that both theories can provide practical insights for occupational guidance and counselling.

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# Expectancy Theory, Decision Theory, and Occupational Preference and Choice[1]

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## Introduction

The choice of an occupation is one of the most important decisions made by a person during his or her lifetime. Most of our waking hours are related to our occupational activities. Our jobs provide the basic economic base for survival, they become entwined with our self-image and self-respect, they consume a large percentage of our time and our psychological and physical energy, and they shape major aspects of our social existence, such as status, life style, friendships, place of residence and attitudes and opinions (Caplow, 1954; Super, 1957).

And the choice is not easy. The Department of Labor's Dictionary of Occupational Titles contains over 30,000 job classifications. While people never actually consider all of these as possible alternatives, they usually consider more than one. Increasing the difficulty of the decision is the fact that many occupations require extensive preparatory training, and quite often weighty decisions about whether to go to college or to engage in some other form of expensive and lengthy training must be made when the individual is very young.

The importance of the occupational decision to the individual is partly a function of its irreversibility. Once certain paths are taken with respect to commitment, training, and experience, it becomes increasingly difficult

to completely change, or even mildly revise the course of things. This, together with the personal responsibilities that accrue with age and family, makes a shift in occupation formidable. Thus, the occupational decision so often made at an early age, may determine the life style and work environment for the rest of one's working years.

On the other hand, an occupational decision is not purely personal, it is important to society as well. Our society is a highly technological one, requiring qualified people to fill various roles. Because of the interdependence that characterizes our economy, a shortage of people to fill certain jobs can result in serious economic difficulties or inequities. Our business, governmental, scientific, engineering and educational institutions need good personnel to maintain their effectiveness and efficiency.

So, most persons find themselves faced with a decision that is difficult in terms of its complexity and in terms of the fact that it comes at a time in life when they may have poor information upon which to make the choice. Yet, the decision has great individual and social importance. It is not surprising, therefore, that the process involved in choosing an occupation has received considerable attention from educators, psychologists and counselors.

Ways to Study the Decision

There are two main approaches to the study of occupational choice: normative and descriptive. The normative approach is concerned with how the decision ought to be made. A mathematical model prescribes (for specific circumstances in which the model's assumptions hold) the kinds of information that should be used, ways in which it should be evaluated and combined, and a criterion for determining the final choice. The descriptive approach, on the other hand, examines how people actually make the choice. Interviews,

questionnaires, and self-reports are used to find out how people came to choose the occupation in which they are currently engaged or in which they intend to engage.

Both approaches interact with one another and, hopefully, are contributing to an increasing body of practical knowledge. As Katz (1963) has pointed out, the field of vocational guidance is increasing in importance by every standard of evaluation. More money is available for research in the area, the status of occupations within the guidance field has increased, and there has been a dramatic increase in the number of practicing guidance counselors. In the following pages we will (1) review the types of theories that have been used to study occupational preference and choice (both normative and descriptive), (2) review the empirical results that support or fail to support these theoretical viewpoints, and (3) review the results of studies in occupational guidance and counseling that are congruent with our theoretical orientation but are more applied in nature.

## Definitional Issues

An initial matter for concern is to clarify the meaning of the domain of interest. Since we will be surveying the research generated by numerous authors using their own views of the occupational choice process, a number of distinctions are necessary. Perhaps the most important distinction is among occupational preference, choice and attainment (Vroom, 1964).

When we speak of one's preference for an occupation, we are describing an attitude. Occupations presumably vary in their attractiveness to different people, and an evaluation of occupational attractiveness is frequently called a preference. These preferences, however, may be different from the individual's actual choice of an occupation. We would expect them to be related to

one another, but because of family pressure, economic conditions, or one's own abilities, the chosen occupation may be very different from the preferred one (Williamson, 1939; Rosenberg, 1957; Strong, 1943).

Even when the individual prefers an occupation and chooses to actually try to enter it, there are cases where the attempt is unsuccessful. Occupational attainment refers to the occupation in which the individual currently or eventually resides. Since the major thrust of this paper is to analyze occupational preference and choice, we will not discuss the determinants of occupational attainment, although the brief historical review presented below does cover some of the research in this area.

## Historical Progress

In general, the underlying aim of almost all of the research in occupational choice has been concerned with the proper match between persons and jobs. The early work was described as Trait-and Factor-theory (Super, 1954; Hahn and MacLean, 1955) and concentrated on the classification of people and the classification of occupational characteristics. More recent approaches follow a similar line of reasoning (e.g., Holland, 1973).

The classification of people might include measures of motives, personality characteristics, abilities or values, With the increased importance of psychological tests in the 1950's and 1960's, a great many classification schemes have been generated. The Strong Vocational Interest Blank is used to compare an individual's interests with the interests of persons who are already in various occupations. The Kuder Preference Record classifies people in terms of nine interest dimensions. The Allport-Vernon Study of Values provides a score for each of six value dimensions. The General Aptitude

Test Battery developed by the United States Employment service is used to assess various aptitudes or skills necessary for success in various occupations. The list could go on, and the interested reader can find reviews of this literature elsewhere (Vroom, 1964; Schuh, 1967; Campbell, Dunnette, Lawler and Weick, 1970; Crities, 1969; Whitney, 1969). The important point is to understand the research process involved. In most cases the abilities, traits, motives or interests of people already in an occupation are used to counsel others about the occupation they should choose. Thus, the classification of the environments and the people parallel one another and are used to ascertain what should be a good "match"; note that it is the attitudes, abilities and interests of those that have successfully attained an occupation that are used as the criteria for counseling and guidance.

In the last ten years, however, a somewhat different approach has been suggested by some researchers. The emphasis is on the choice process itself; how should and how do people choose an occupation. While some reference may be made to the characteristics of people already in that occupation, the central concern is with the individual's perceptions of the outcomes of a particular choice and the importance of these outcomes to him or her. In short, how does the individual use information about particular occupations in order to arrive at a final choice.

## Expectancy Theory

It has been over a decade since Victor Vroom wrote his excellent book, Work and Motivation (Vroom, 1964). Building on some earlier work of

Georgopoulous, Mahoney and Jones (1957), Vroom made the first explicit formulations of expectancy theory applied to organizational behavior. This theory is currently described as "perhaps the most widely accepted theory of work and motivation among today's industrial and organizational psychologists" [Wahba and House, 1974, p. 121].

Expectancy theory can be seen as one member of a class of very similar theories. The similarities are based on the idea that

> the strength of a tendency to act in a certain way depends on the strength of an expectancy that the act will be followed by a given consequence (or outcome) and on the value or attractiveness of that consequence (or outcome) to the actor [Lawler, 1973, p. 45].

The two components are seen as combining in a multiplicative manner.

These ideas are neither new nor unique in psychology, they have been central to many of the major theories of learning, decision making, attitude formation, personality development, and motivation (Table 1 lists some major theorists using them), but Vroom has been instrumental in introducing them in industrial and organizational psychology.

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Insert Table 1 about here

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According to Vroom's conceptualization, choice of an occupation depends upon the degree to which a given alternative is seen as more likely to lead to valued outcomes than any other alternative. Vroom's presentation of the theory included both a formula to predict occupational preference and one to predict occupational choice, and these models are reviewed below.

## Theoretical Development

Vroom (1964) presented two models, the first for the prediction of the valences of outcomes, and the second for the prediction of force toward

Table 1

Labels Used for Theoretical Components

| Theorist | Determinants of impulse to action |
|---|---|
| Tolman | Expectancy of goal, demand for goal |
| Lewin | Potency X Valence |
| Edwards | Subjective Probability X Utility |
| Atkinson | Expectancy X (Motive X Incentive) |
| Rotter | Expectancy, reinforcement value |
| Vroom | Expectancy X Valence; where valence is Instrumentality X Valence |
| Peak | Instrumentality X Attitude (affect) |
| Rosenberg | Instrumentality X Importance |
| Dulany | Hypothesis of the Distribution of the Reinforcer X Value of the Reinforcer |
| Fishbein | Probability X Attitude |

Note. This table is a modification of one presented by Lawler (1971).

behavior. An outcome is simply anything an individual might want to attain. The valence of an outcome for a person is defined conceptually as the strength of his positive or negative affective orientation toward it. Similar to Lewin's use of the term, valence refers to the anticipated satisfaction associated with an outcome, and is distinguished from the value of the outcome--the actual satisfaction resulting from attainment of the outcome.

The valence model states that the valence of an outcome to a person is a monotonically increasing function of the algebraic sum of the products of the valences of all other outcomes and the person's conceptions of the specific outcome's instrumentality for the attainment of these other outcomes. Symbolically,

$$V_j = f\sum_{k=1}^{n} (V_k I_{jk}),$$

where

$V_j$ = the valence of outcome j;

$I_{jk}$ = the cognized instrumentality of outcome j for the attainment of outcome k;

$V_k$ = valence of outcome k;

n = the number of outcomes

Cognized or perceived instrumentality is defined conceptually by Vroom as the degree to which the person sees the outcome in question as leading to the attainment of other outcomes. Instrumentality varies from minus one (meaning that the outcome in question is perceived as never leading to the attainment of the second outcome) to plus one (meaning that the outcome is perceived as always leading to the attainment of the second outcome).

Although this model can be used to predict the valence of any outcome, it has been applied most frequently to the prediction of job satisfaction,

occupational preference, or the valence of good performance. In essence, the model says that the worker's satisfaction with a job or anticipated satisfaction with an occupation results from the instrumentality of the occupation for attaining other outcomes and the valence of those outcomes. In the remainder of this article, we refer to this model as the valence model.

Vroom's second model predicts the force toward behavior. The force on a person to perform an action is conceptualized by Vroom as a monotonically increasing function of the algebraic sum of the products of the valences of all outcomes, and the strength of the person's expectancies that the action will be followed by the attainment of these outcomes (Vroom, 1964). Symbolically,

$$F_i = \sum_{j=1}^{n} (E_{ij} V_j),$$

where

$F_i$ = the force on the individual to perform action i;

$E_{ij}$ = the strength of the expectancy that action i will be followed by outcome j;

$V_j$ = the valence of outcome j;

n = the number of outcomes.

The individual's expectancy is defined by Vroom as his belief concerning the probability that the behavior in question will be followed by the outcome of interest. An expectancy is a subjectively perceived probability and, therefore, ranges from zero to plus one. It is distinguished from instrumentality in that it is an action-outcome association, while instrumentality is an outcome-outcome association. While expectancies are perceived probabilities, instrumentalities are perceived correlations.

Vroom suggested that this force model can be used to predict choice of occupation, remaining on the job, and effort. For occupational choice we would want to know the expectancy that a given choice would lead to occupational attainment and the valence of attainment. This latter valence would be composed of the same variables used to predict occupational preference. In effect, the valence or preferability of an occupation is multiplied by the probability that one can actually attain it, and this product reflects the overall force for the individual to make that choice. The individual will supposedly choose that occupation with the greatest force. We will refer to this model as the choice model.

In most cases the valence model has been used to predict job satisfaction, and the choice model has been used to predict job effort. Reviews of the empirical studies using these models for these criteria are available in the literature (Mitchell and Biglan, 1971; Heneman and Schwab, 1972; Mitchell, 1974). As a summary, the data show the average correlation between job satisfaction and the predictions of the valence model to be around .45, and between job effort and the predictions of the choice model to be around .35 (Mitchell, 1974). We will review the results for occupational preference and choice later in this article.

Conceptual and Methodological Problems

While detailed reviews of the inadequacies of expectancy theory can be found elsewhere (Mitchell, 1974), it seems pertinent to at least touch on a number of major concerns. First, it is not clear how an investigator or counselor should ascertain what outcomes would be most relevant for a particular individual or a particular occupation. Obviously, when salient outcomes

are omitted, the predictive ability of the model is limited. Just asking job candidates is inadequate because their knowledge may be limited or inaccurate. On the other hand, if the counselor uses some standard list of outcomes mentioned by a large number of people previously tested, he runs the risk of omitting an important outcome for a particular person. There has been little agreement about the resolution of this problem.

A second set of problems focuses on the measures of the theoretical components. In many cases, instrumentalities are treated as expectancies or expectancies are measured as if they were instrumentalities. The valence measures sometimes reflect importance and at other times affect. Clarification and standardization in this area are sorely needed.

Finally, a number of mathematical and theoretical assumptions built into the model are largely untested. Since the scales used to measure the theoretical components are ordinal at best, they cannot truly be used to reflect an underlying multiplicative relationship (Schmidt, 1973). Inferences about the underlying psychological properties are therefore formally inappropriate.

A related issue involves the manner in which the theory has been tested. In many cases, a preference or choice score for one occupation (e.g., going into business) is generated for each individual in a group of subjects, and these scores are correlated with some other, independently gathered criterion such as an attitude measure. Thus, each subject has a $\Sigma IV$ score and an attitude score for one occupation, and these two scores are correlated over a large sample to see if increases in preference ($\Sigma IV$) are related to increases in attitude. This practice runs counter to the original theoretical formulations made by Vroom. He specifically stated that preference and choice were

within-subject relative processes. One must examine a specific individual's ΣIV's for a set of occupations and relate these scores to some independent rating or ordering of these occupations. The same would be true for the occupational choice model. Thus, while Vroom saw expectancy theory as an individual decision-like approach, its use in practice has often deviated from this conceptualization. In order to understand this point more fully, we turn to the decision theoretic models that are most relevant to occupational preference and choice.

## Decision Theory

The fundamental principle in decision theory, the principle of maximization of expectation, was first formally stated by Pascal in 1669. However, it has been only recently that psychologists have attempted to use it as a model for behavior (Edwards, 1954, 1961). Simply stated, the expectation for any action is the algebraic sum across potential outcomes, of the values of each of the possible outcomes of that action and their respective probabilities of occurrence should the action be performed. The maximization principle prescribes that the action that has the maximum expectation will be the one choosen.

When actuarial probabilities and market values are used to calculate expectations, the term maximization of expected value (EV) is used. When subjective probabilities and subjective values (utilities) are used, the term is maximization of subjective expected utility (SEU). The former, EV, is normative in that following its prescriptions will, in the long run, yield the greatest possible record of gain. The latter, SEU, is an attempt to make the normative model descriptive by substituting subjective components

for the "objective" ones. The move to a descriptive model is necessitated by abundant evidence that actuarial and subjective probabilities and market value and utility frequently are not the same (Edwards, 1954, 1961). Therefore, in what follows, we shall deal only with SEU and with two variants of SEU, expected utility (EU), in which the probabilities are assumed to be 1.00 and are omitted from the computations, and weighted expected utility (WEU), in which the probabilities are replaced with an index of the importance of each of the various kinds of outcomes under consideration to the decision maker's occupational decisions in general.

Theoretical Development

The SEU for a possible course of action (e.g., choice of occupation i) is:

$$SEU_i = \sum_{k=1}^{n} (\psi_k U_k)$$

where

$\psi_k$ = the probability that outcome k will occur if action i were selected;

$U_k$ = the utility of receiving outcome k.

That is, the SEU for action i is the sum over all outcomes, k = 1 to n, of the sums of the expected utility ($\psi_k U_k$) associated with each outcome. The SEU for all possible actions are compared and, following the maximization principle, the action with the maximum SEU is the prescribed choice.

In terms of occupational choice, the SEU model would be used as follows: All the possible occupations (i.e., ones with a good chance of attainment) being considered would be the alternative actions. The individual then assesses his or her subjective probabilities that each occupational alternative would lead to various job outcomes (e.g., pay, promotion, autonomy, etc.) and also the value he or she attaches to each outcome. An SEU is computed for each occupational alternative, and the person should choose the alternative with the maximum SEU.

The SEU model weights the utilities of the outcomes by their subjective probabilities of occurrence. However, in some situations there is no doubt about whether or not the outcomes will occur if a specific choice is made. In this case the model simplifies to

$$EU_i = \sum_{k=1}^{n} U_k,$$

that is, the expected utility of action i is the sum of the utilities of its k=1 to n outcomes; $U_k$ can be positive or negative.

If the various outcomes differ in importance to the decision, they can be weighted by their importance to permit them to differentially contribute to the "weighted expected utility," (WEU).

$$WEU_i = \sum_{k=1}^{n} I_k U_k,$$

where $I_k$ is the importance of the $k^{th}$ kind of outcome to the decision and $U_k$ is the utility of the particular outcome at hand to the decision maker. The WEU model is appropriate in cases in which the applicant has a high utility for, say, an office with orange walls as opposed to any other color, but, in general, the color of the office walls is nearly irrelevant to his or her

decision about whether to choose a specific job. So, if a job featured an office with orange walls, the $U_k$ would be large but it would contribute little to the decision because it would be weighted by a very small $I_k$. As with SEU, the EU and WEU models assume that the decision maker will choose the alternative (i.e., job) that has the maximum utility.

Conceptual and Methodological Problems

One of the issues of concern in Behavioral Decision research has been whether it is reasonable to assume that subjective probabilities are congruent with the dictates of probability theory. This is a very strong assumption, requiring as it does a mathematical precision in subjective probabilities that seems unlikely to exist. Of course, it is possible to adopt a more tolerant criterion and ask if there is sufficient similarity to justify the use of SEU as a descriptive model. But, even with this criterion, the experimental evidence is not decisive; for simple, familiar events there is evidence suggesting that the congruence may be good enough for most real-life intuitive decision making (Barclay and Beach, 1972; Beach and Peterson, 1966; Peterson, Ulehla, Miller, Bourne and Stilson, 1965). Other investigators strongly disagree with this conclusion, however (Tversky and Kahneman, 1974; Slovic and Lichtenstein, 1971), and the issue is far from settled. On the other hand, Edwards (1954) has questioned whether it is a necessity for such congruence to exist in order to use the SEU model as a descriptive model--congruence is desirable primarily because without it it can be shown that a person would be willing to engage in grossly irrational decision practices. Of course, we know that people often engage in irrationality, so it may be appropriate to reflect such conditions in the descriptive model. This view has not received very much attention recently, but perhaps it deserves renewed consideration.

In addition to the congruence question, there also is a question about how subjective probabilities should be measured. Many studies have taken a direct approach and asked subjects for straightforward verbal assessments. These are made on scales that are labeled from .00 to 1.00, by dividing 100 markers into stacks, by stating odds, or the like (e.g., Peterson, Schneider and Miller, 1965; Beach, 1968; Phillips, Hays and Edwards, 1966). Other studies have used indirect measurement methods, the two most common methods involve inferring subjective probabilities from bets (e.g., Preston and Baratta, 1948) or from scoring rules (Murphey and Winkler, 1970). There seems to be an assumption on the part of some investigators that the indirect methods are somehow more pure, more scientific. But, in the only two studies that have attempted careful comparisons between individual subjects' subjective probabilities from bets and from verbal assessments for the same events, fairly high agreement has been found (DuCharme and Donnell, 1973; Beach, 1974).

A third question is about whether utilities are additive. The computation of SEU involves the summing of weighted utilities, where the weights are subjective probabilities. Results of the studies that have examined additivity most extensively are in conflict: For example, Tversky (1967a) found that 32 of the 33 cases he examined evidenced additivity, while Anderson and Shanteau (1970) and Shanteau (1974) found that the subjects added, but not perfectly. This issue, too, is not yet resolved.

Overall, these three issues leave things rather unsettled. But the tentative inclination on the part of researchers who are interested in real world applications of SEU seems to be somewhat cavalier: Assume subjective probabilities are reasonably congruent with probability theory, use direct verbal methods to measure them (and to measure utilities), assume that utilities

are additive, and if it works, use it and do not get too caught up in the subtleties. As we will see, the experimental studies suggest this rough and ready approach can produce good results with regard to the prediction of occupational choice.

## Policy Models

There are two additional models that, while only one of them has been used in studying occupational choice, are sufficiently similar in form to the expectancy and decision theory models to warrant discussion. These are the multiple regression model and Anderson's Information Integration Theory. Both are used in a slightly different way than the two previous models--instead of being used to predict either behavioral intent or behavior itself, they are used to infer a person's policy (or strategy) for using various kinds of information to arrive at some sort of judgment. Prediction, insofar as it is a goal, is accomplished by applying the inferred policy to new information on the assumption that the person will continue to use that policy for subsequent judgments.

The regression model. The regression approach to capturing an individual's policy consists of identifying the kinds of information that are relevant to the judgment in question and then applying regression analysis to a number of cases that he or she has examined and made a judgment about. The $k = 1$ to $n$ kinds of information are treated as predictor variables and the individual's judgments are treated as the criterion variable, $Y_i$. Each case, $i$, is given a quantitative score on each variable by the experimenter, the regressio

analysis is performed, and the resulting regression equation is regarded as the model of the person's policy:

$$\hat{Y}_i = a + b_1x_1 + b_2x_2 + \ldots + b_nx_n,$$

where

$\hat{Y}_i$ = the best prediction the equation can make of the person's judgment, $Y_i$, for any given case, i;

a = the intercept, which seldom is of much interest;

$b_k$ = the slope of the regression line for predictor variable k;

$x_k$ = the quantified scale value of the information on variable k.

The multiple regression coefficient, R, is the correlation between the predicted judgment, $\hat{Y}_i$, and the observed judgment, $Y_i$; i.e., the success of the equation in accounting for the person's responses. If R is high it is concluded that the equation is an adequate representation of the individual's information utilization policy. With slight adjustment (Hoffman, 1960) the beta weights, $b_k$, can be regarded as indices of the contribution of each of the different kinds of information to the person's final judgment.

Regression analysis and analysis of variance (anova) are two sides of the same coin (Cohn, 1968). Therefore, an alternative approach is to perform an anova on the individual's judgments. With slight adjustments (Hays, 1963), the amount of variance in the judgments accounted for by each information variable can, like the beta weights, be interpreted as an index of the information's contribution to the judgments. The advantage of the anova method of analysis is that it detects configurational information utilization in the form of significant interactions--multiple regression assumes non-configurational use, and when such use exists it often is difficult to ferret

it out (Hursch, Hammond, and Hursch, 1964). On the other hand, the anova method requires that all possible combinations of the different levels of each information variable be represented in a factorial design. When there are more than a few levels and/or more than three or four information variables, this requirement can result in an extremely large set of cases for the individual to make judgments about, and some of the cases are likely to be quite nonrepresentative of real-life cases and therefore not make much sense. The regression method does not require a factorial design.

Integration Theory. The second policy model, Integration Theory, is similar to the first in that it examines cases about which a person has made judgments and infers his or her policy from the behavior. Anderson and his colleagues have used the model extensively and have developed a wide variety of techniques for investigating specific questions. Therefore, what follows is merely the basic notions.

Integration Theory differs from the regression model in that it does not assume that the information necessarily is utilized in an additive manner. Indeed, three kinds of algebraic models have been used, and the point of many studies has been to see which of them is appropriate to the judgments of interest.

The additive model is simply,

$$R_i = x_i + y_i;$$

the response, R, for a given case $i$ is a function of the sum of the information about the case on variable x and the information about it on variable y. This model is tested by showing the subject all combinations of x and y in a factorial design and obtaining R for each combination (case). This produces an x by y matrix with an R in each cell. If the additive model is appropriate,

an anova on the R yields significant main effects for x and for y and no significant interaction. Moreover, the absence of an interaction indicates that R is an interval scale, and the marginal means of the matrix reveal the subject's subjective scale values for x and for y (Anderson, 1972). A subtractive model has the same properties as an additive model.

The averaging model is a variation on the additive; the information on variable x is assumed to be weighted by w before being added to the information on variable y which is weighted by 1-w, i.e., the weights sum to 1.00. It is this restriction on the sums of the weights that results in averaging. The model is:

$$R_i = wx_i + (1-w)y_i;$$

the judge's response R to case i is a function of the average of information on variable x and on variable y.

As for the additive model, the R for the averaging model are submitted to anova, and the significance or nonsignificance of the interaction is the key to decisions about the appropriateness of the model. Again, the marginal means of the matrix can be used for obtaining subjective scales. Averaging has been shown to be the appropriate model for personality impression formation and attitude change (Anderson, 1971; Anderson and Alexander, 1971) and could reasonably be expected to be appropriate for appraisals of occupations and, perhaps, for subsequent choices among them.

The multiplicative model is:

$$R_i = x_i y_i;$$

the response, R, to case i is a function of the product of the information on variable x and the information on variable y. Again, the anova interaction

is the key; when the interaction is significant and the R in each row of the matrix are plotted as a function of the columns, the result is a fan of curves that evidences the multiplicative relationship. Manipulation of the values on the abcissa of this plot so that the curves are as near to being straight lines as is possible yields the subjective scale for the columns of the matrix.

The foregoing equations all had only two information variables, x and y. More can be used, but the analysis of variance quickly becomes complicated and higher level interactions are difficult to interpret. And, as was true for the regression-anova method, the requirement of factorial generation of cases for the subject to judge can lead to a vast number of cases if there are many variables, and some of the cases may be meaningless.

Aside from these criticisms, however, it is difficult to find much to fault the Information Integration approach. It is purely empirical; it imposes no model on the data and it imposes no scales. Indeed, the method reveals the model (policy) latent in the data and even yields the subjective scales underlying the judge's appraisal of the cases. While there are similar methods of using matrices to attain these ends, notably simultaneous conjoint measurement (Tversky, 1967), only Integration Theory has generated very much research.

As was said earlier, the policy capturing models have been infrequently applied to occupational choice. The point of discussing them here is that they <u>should</u> be applied to this area. They are highly similar to Expectancy Theory and SEU in that their basic form is the linear equation (under a log transformation, multiplicative models become linear). And, they are used in investigating much the same kinds of issues--the way in which and the degree to which various considerations influence people's evaluations of situations, objects, and events.

Perhaps the most straightforward application of a policy model to occupational choice would be to have a judge (or a group of similar judges) rate the acceptability of a set of simulated jobs (cases) that vary on a number of relevant dimensions (e.g., pay, promotions, vacations, etc.). Then the policy would be inferred by whichever model was deemed appropriate. The policy could then be used to predict subsequent judgments of acceptability and, assuming the maximization principle from SEU, of actual occupational choice.

This type of information would be valuable to vocational guidance counselors. They would know what dimensions were important and how important they were for a particular candidate. The counselor would be better able to search for and provide data on jobs that fit the applicant's decision policy. In essence, the policy capturing technique helps to determine the individual's underlying values through a simulated set of decisions. Whether this technique is more effective than the direct questioning about utilities employed in the expectancy and decision theoretic approaches has yet to be tested.

## Empirical Evidence for the Theories

Although all of the theoretical and methodological alternatives described above may be useful for predicting occupational preference and choice, in practice only the expectancy and decision models have been frequently used. Even at that, in most cases the use of the model was motivated more by a concern for testing the adequacy of the theory than by concern for the implications for occupational guidance or counseling. We will discuss the research with more applied implications after our review of the theoretical tests.

Expectancy Theory Tests

We classified studies as expectancy tests if they used an EΣIV or ΣIV to predict choice or preference. Some of the research uses models highly similar to a SEU formula, and was therefore hard to catagorize. However, if Vroom's work seemed to be the major theoretical foundation for the research it was classified as an expectancy study.

A summary of the results is presented in Table 2.

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Insert Table 2 about here

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Vroom's (1966) first study had instrumentalities and valence measures for 15 goals for each of three occupations. Both I's and V's were measured by a forced distribution technique (e.g., 2, 3, 5, 3, 2). For example, for the 15 goals the subject had to give two very favorable valence ratings and two very unfavorable ratings, three were given moderately favorable ratings, and so on. A ΣIV index based on Cohen (1957) was generated that produced performance scores that varied from +1.00 to -1.00. Each occupation was rated separately on a scale from 1 to 11, and Vroom showed clearly that those occupations receiving high ratings also had high ΣIV scores. For example, he reported that the ΣIV score was .58 for those with criterion ratings of 11, and .03 for those with criterion ratings of 5 or below.

A later follow-up study with the same subjects showed similar findings (Vroom and Deci, 1971). After having been out of school and in a job for one year the mean ΣIV rating or organizations with a criterion value of 10 or above (in most cases the chosen organization) was .64 and after three years .61. The mean ΣIV rating for organizations with a criterion value of seven or below was .00 after one year and .17 after three years.

Table 2

Summary of Empirical Research using Expectancy and Decision Theories to Predict Occupational Preference and Choice

Expectancy Approaches

| Investigator | Model | Criteria | Results | p |
|---|---|---|---|---|
| Vroom, 1966 | ΣIV | Preference | See Text | Positive Support |
| Sheard, 1970 | ΣIV | Preference | $\bar{r}$ = .80[a] | .01 |
| Vroom and Deci, 1971 | ΣIV | Preference | See Text | Positive Support |
| Wanous, 1972 | ΣIV | Preference | Binomial | .028 |
| Mitchell and Knudsen, 1973 | ΣIV | Choice | r = .38 | .01 |
| | ΣIV | Preference | r = .69 | .01 |
| Sheridan, Richards and Slocum, 1975 | EΣIV | Difference between choice and comparison candidate | F = 29.51 | .01 |
| Lawler, Kuleck and Rhode, 1975 | ΣIV | Preference | $\bar{r}$ = .34[a] | .01 |
| | EΣIV | Choice | $\bar{r}$ = .40[a] | .01 |

Decision Theory Approaches

| | | | | |
|---|---|---|---|---|
| Holmstrom and Beach, 1973 | SEU | Preference | $\bar{r}$ = .83[a] | .01 |
| Muchinsky and Fitch, in press | SEU | Preference | $\bar{r}$ = .81[a] | .05 |
| Pieters, 1968 | $IA_b$ | Choice | 92% Correct | |
| Pieters, Hundert and Beer, 1968 | IA[b] | Choice | 86% Correct | |
| Huber, Daneshgar and Ford, 1971 | 5 Utility Models | Preference | $\bar{r}$ = .67[a] | .01 |
| | | Choice | See Text | .001 |
| Ford, Huber and Gustafson, 1972 | 5 Probability Models | Choice | 81% Correct | |
| Phillips, 1970 | EVD[b] | Preference | See Text | .01 |

[a]These data reflect mean correlation coefficients.

[b]These models are modifications of true expected value models. They are described in the text.

Sheard (1970) based his research on Vroom's formulation, but his procedures closely approximate an expected value model. Each subject did a paired comparison preference ordering for six types of organizations (e.g., small business, military service), and the preference scores were ranked to serve as the criterion. The predictor was a $\Sigma IV$ generated from an instrumentality of each occupation for the attainment of 20 outcomes and the valence of these outcomes. A correlation was generated for each subject between his six $\Sigma IV$ scores and his six preference ranks. The mean correlation across subjects was .80 ($p < .01$).

Wanous (1972) had students rank order occupations and then looked at the $\Sigma IV$ scores for the occupation with the highest rank compared to lower ranked occupations. He reported that the mean $\Sigma IV$ index scores were significantly related to the preferred occupation using a binomial test across four groups.

Mitchell and Knudsen (1973) gathered 106 students' attitudes towards business and whether they were actually choosing business as an occupation. Each student also indicated the degree to which business was instrumental for the attainment of 12 outcomes and the attractiveness of these outcomes. A $\Sigma IV$ for business was computed for each student and the correlation across students for their attitude towards business was .69 ($p < .01$). The correlation with choice was .38 ($p < .01$).

Sheridan, Richards and Slocum (1975) had nurses generate $E\Sigma IV$ scores for a variety of jobs over the five month period preceeding graduation. He then compared the force score of the job that was actually chosen with those that were rejected and found they were significantly different ($F = 29.59$, $p < .01$). The job with the highest $E\Sigma IV$ tended to be the one actually chosen.

Finally, Lawler, Kuleck and Rhode (1975) gathered $\Sigma IV$ and $E\Sigma IV$ scores for a large sample of accounting students. Attitude scores served as a

preference measure and the completion of an actual job interview with one of eleven accounting firms served as the choice criteria. The correlation of $\Sigma IV$ with the attitude score was .34 ($p < .01$) and the correlation of the $E\Sigma IV$ with the choice criterion was .40 ($p < .01$). These results are somewhat weaker than the other research, but that is due partly to the fact that little variance was found in the ratings of the 11 accounting firms. Also, one should note that both the Sheridan et al. (1975) study and the Lawler et al. (1975) study used job choice rather than occupational choice as the criterion. While theoretically, these decisions may follow highly similar processes, they are not the same thing.

Decision Theory Tests

In this section we will first review studies that have used the SEU model, then those that have used the EU or WEU model, and finally some that have used models that, while they are in the spirit of decision theory, are not strictly SEU or WEU models.

The first SEU study was done by Holmstrom and Beach (1973) with participants who were senior undergraduate psychology majors, all of who planned to go on to graduate school in psychology. Ten of these students were interviewed about the kinds of outcomes they expected to receive from a career in psychology. Eighteen kinds of outcomes were found to be commonly mentioned. Then seven of the original ten students and an additional 23 similar students were asked to rate the relative preferability of eight occupational alternatives in the psychology profession. In addition, they rated each of the 18 kinds of outcomes in terms of its utility for ultimate occupational satisfaction. Then they assessed their subjective probabilities that each occupation would provide

a satisfactory degree of each kind of outcome. The utilities and subjective probabilities were used to compute SEU's for each of the eight occupations for each student. Then each student's eight SEU's were correlated with his or her eight occupational preference ratings to see how well the relative magnitudes of the SEU's corresponded to the relative preferences. The mean and median correlations were .83 and .78 respectively, with 23 of the correlations for the 30 students (76%) statistically significant in the right direction at or beyond the .05 level of confidence.

Using precisely the same experimental paradigm as was used by Holmstrom and Beach, Muchinsky and Fitch (in press) interviewed ten graduate students in Industrial Relations about the occupational and educational outcomes they considered when planning their course of study. Fourteen kinds of outcomes were commonly mentioned. Next, a different group of 15 students was asked to rate the relative preferability of the six academic areas in the Industrial Relations program. In addition, the students rated the fourteen kinds of outcomes in terms of their utility, i.e., how important it was that the outcomes be realized by the student's participation in the program. Finally, the students assessed their subjective probabilities that each of the six academic areas would produce a satisfactory level of each of the 14 kinds of outcomes. The utilities and subjective probabilities were used to calculate SEU's for each of the six academic areas and, for each student, these SEU's were correlated with the student's ratings of the preferability of the academic areas. The mean and median correlations were .81 and .84 respectively and 11 of the correlations for the 15 students (73%) were statistically significant in the right direction at or beyond the .05 level of confidence. These results are virtually identical to those reported by Holmstrom and Beach.

Turning now to the WEU research, Pieters and his associates, using what they describe as a decision model employing an "index of attractiveness (IA)" examined the decision process of recruits at Corning Glass Works. The first report (Pieters, Hundert and Beer, 1968) described the IA in some detail: Each applicant rated the attractiveness (utility) and the importance of a number of job characteristics for a number of organizational alternatives. The attractiveness was weighted by importance by multiplying the two ratings for each characteristic and then summing over characteristics. This IA for each alternative was used to predict job choice. In the Pieters et al. (1968) study, 86% of the applicants chose the job with the highest IA. In a study which replicated the above procedures (Pieters, 1968) 92% of the respondents chose the job with the highest IA.

The WEU model also was used by Huber, Daneshgar, and Ford (1971) to predict job preference and job choices. Actually, there was the WEU model, the multiple regression model that was described above, and three variations on them. We will not discuss the variant models. The thirty participants in the study, 15 experienced teachers and 15 inexperienced teachers, were all seeking employment in the public schools through a university placement office. They all made ratings of how satisfactory they thought 30 hypothetical jobs would be, i.e., preference ratings. They also eventually accepted a real job, and the question was whether the model, using the preference rating information, could predict which job would be chosen.

Each of the different levels of five different kinds of outcomes (e.g., salary, location, etc.) were rated in terms of how satisfied the person would be with each (utility), and the five different kinds of outcomes were themselves rated on their overall importance to the decision. The

importance ratings were used to weight the satisfaction (utility) ratings for the outcomes and were used to compute a WEU for each of the 30 hypothetical jobs. Then, for each person, the WEU's were correlated with the preference ratings he or she had made for the 30 hypothetical occupations to see if the latter were related to the former. The mean and median correlations for the 15 experienced teachers were both .62, and all 15 correlations were significant at or beyond the .05 level of confidence. The mean and median correlations for the 15 inexperienced teachers were .67 and .64 respectively and, again, all 15 correlations were significant at or beyond the .05 level. More important, using the utility and importance ratings in the WEU model to predict which real job each teacher would take permitted correct prediction of 18 of the 30 teachers' (60%) actual job choices. The latter is pretty impressive given that the placement office screened the job offers before sending them to the applicants and thus, the jobs the applicants had to decide among were all fairly desirable. This means that the model had to identify the best of the best, a requirement that demands precision.

Turning to studies that used models that were not strictly SEU or WEU models, Ford, Huber and Gustafson (1972) used a paradigm that was similar to that used by Huber, Daneshgar and Ford. Again, the task was to predict job choices for school teachers--except that, in contrast to the former study in which only utilities were used, in this study only subjective probabilities were used. Participants assessed their subjective probabilities about whether they would accept a job with particular characteristics (salary, location, etc.) or they assessed subjective likelihoods about whether a job that they accepted would have certain characteristics. These subjective probabilities and likelihoods were used in five probability models, all of

which predicted the teachers' subsequent job choices quite well--an average of 79% correct predictions.

Phillips (1970) had 2674 physicians who were entering six fields of medicine rate the importance of ten occupational values and the likelihood that each of the six occupations would lead to these values. An "expected value deprivation" score (EVD) was generated for each physician for each occupation by summing the difference between the value score and the expectation of fulfilling the value. A separate rank order of the six occupational options was used as the preference criteria.

The results were clearly supportive. Low EVD scores were given to the highly favorably ranked fields while high EVD scores were associated with low ranking fields. For example, those fields that had an EVD of 1.0 (the scores could vary from one to six) received a favorable rank from 86% of the physicians, while those fields with an EVD of 6.0 received favorable ranks from only 17% of the participants.

An overview of both the expectancy and decision theory results suggests overwhelmingly that some sort of expected value model provides a good representation of the occupational preference and choice processes. While important distinctions exist between and among these different models, the similarities are more striking. At the heart of all of these models is a rational, maximization principle: People will prefer and choose those occupations they believe are most likely to lead to the highest personal benefit.

A Policy Model Test

There has been only one test of the policy models in occupational preference and choice, the regression model. As part of the study by Huber,

Daneshgar, and Ford (1971) that was discussed above, the 15 experienced and 15 inexperienced school teachers rated 30 hypothetical jobs in terms of how satisfactory each would be. Using these 30 ratings as the dependent variable and the values of the five characteristics of each of the hypothetical jobs (salary, location, etc.) as independent variables, the experimenters performed regression analyses that yielded a regression equation for each teacher. The equation is, in theory, a model of the teacher's job evaluation policy. The multiple regression coefficient is an indication of how well the equation is able to account for the 30 satisfaction ratings; the mean and median multiple regression coefficients for the 15 experienced teachers were .80 and .86 respectively and nine of the coefficients for the 15 people were significant at the .05 level of confidence. The mean and the median coefficients for the inexperienced teachers were significantly lower than for the first group--.41 and .44 respectively and only three of the 15 coefficients were significant.

This difference between the two groups also is reflected in the ability of the regression model to predict actual job choices. For every teacher, the job descriptions that were received from the placement office were submitted to his or her policy equation and then ranked in terms of predicted preferability; it was predicted that the teacher would choose a job that ranked at or near the top of the list. For seven of the 15 experienced teachers the chosen job was first on the researchers' lists (and one was second and one was third). Only two of the 15 inexperienced teachers chose the job the researchers predicted they would (although three chose the second and six chose the third). Thus, while the regression model worked fairly well for the experienced teachers it did not do well for the inexperienced

teachers, although the WEU model did well for both groups. Huber, Daneshgar, and Ford see this as suggesting ". . . that the validity associated with various models also may be a function of the type of subjects whose preferences are being predicted (1971, p. 280)."

## Implications for Practice

While the above research was primarily designed to support certain theoretical propositions, some studies have been conducted which demonstrate the practical importance of viewing the occupational choice process in an expected value framework. For example, there are a number of studies which show that people often become less satisfied with their chosen occupation after they have entered it (e.g., Vroom and Deci, 1971; Lawler et al., 1975). There are two possible implications of these results. One suggestion might be that if job candidates actually thought out what occupational outcomes were important and unimportant and how likely it was that various occupations would lead to those outcomes, they might make a more rational and satisfactory choice. A second suggestion is that counseling and guidance efforts might concentrate on providing more information about the actual likelihoods of attaining various outcomes, and the chances of a particular candidate being able to attain the occupation rather than the more traditional information about how similar the candidate is to those people already in the occupation.

Some research is currently available which addresses itself to these issues. In terms of providing more accurate information about what jobs are actually like, the use of job previews has been suggested (Wanous, 1974). A number of experimental field studies have shown that job recruits who

receive accurate job information have lower turnover (Farr, O'Leary and Bartlett, 1973; Macadonia, 1969; Ilgen and Sealy, 1974) and higher performance (Overall and Meyers, 1966) than control group recruits who received the standard information traditionally given to all applicants. In some cases (e.g., Farr et al., 1973) there was even an increase of people who turned down the job offer after receiving the more accurate information.

Porter and Steers (1973) have suggested that the job preview provides more realistic expectations and therefore facilitates a rational decision process. This interpretation is, of course, exactly what we are suggesting. Wanous (1974), in fact, showed that providing a film of people on the job (telephone operators) significantly changed the expectations of job candidates. Also, Ilgen and Sealy (1974) provide support for the idea that more accurate job previews helps the individual to cope with his new job environment. Thus, the evidence seems fairly convincing that accurate job information aids both the selection and adjustment process involved with choosing an occupation.

The second implication, and one that is perhaps more directly relevant for decision theory, is that the process of working through expected value-like formulations may aid the candidate to make a more effective and satisfactory decision. Two techniques have been researched which bear directly on this hypothesis. Janis (1969) developed what he calls a "decisional balance-sheet procedure" where students faced with choosing an occupation are asked to list their alternatives and the positive and negative outcomes of each alternative. These outcomes are placed in four categories representing utilitarian gains or loses to self; utilitarian gains or loses to others; social approval or disapproval; and self-approval or disapproval. The student rates each outcome in terms of its importance and then an overall favorability estimate can be generated using a model similar to the utility models from decision theory.

In Janis (1969) first study, 18 Yale seniors followed this procedure and were compared to 18 control students who engaged in an open interview about their choice of an occupation. The experimental students listed and considered more outcomes than the control students, and more than half reported changing their evaluations of their previously preferred alternative compared to one control group student who changed his evaluation.

A follow-up study by Mann (1972) reported similar results. Employing the same procedure, Mann actually followed-up the participants after their occupational choice had been made. The experimental participants showed somewhat less post-decisional regret and were able to be more objective about the consequences of their decision than control participants. Research in other settings (e.g., Hoyt and Janis, 1975) has shown that this type of approach increases commitment to the chosen alternative as well. Thus, this type of balance sheet procedure may be helpful for the occupational choice process.

A somewhat more complex procedure, called the System of Interactive Guidance and Information (SIGI), has been suggested and received initial empirical support by Katz (1966, 1973). In Katz's model, which is computer based, information is gathered about the applicant's value system (e.g., importance ratings of actual job outcomes on a set of 10 value dimensions) after a rather intensive interaction between the counselor and applicant. Along with the importance ratings, a minimum level of acceptability for each outcome dimension is generated. This part of the model is appropriately called the value system. The information system provides as accurately as possible the actual likelihood that a particular occupation will result in a particular outcome based upon actual labor statistics and other research data. These likelihoods are multiplied by the importance ratings and summed to

produce what Katz calls a "Sum of Value Returns (SVR)" for each job. The third input is called the prediction system, and it represents the chances that a particular applicant (based upon his skills, grades, personality) will actually be able to attain a particular occupation. This score is multiplied by the SVR to produce an expected value score for each occupation.

While this system is currently being tested on a large scale, there is some preliminary empirical support for its utility. Chapman, Morris and Katz (1973) have conducted one study with 61 entering freshman students from a community college. The students were matched according to area of interest, grade point average, and sex and randomly assigned to experimental and control conditions. The 31 experimental students participated in the SIGI system, had a thorough oral interview about job preferences in which a number of criteria were assessed (such as planning and amount of information used for occupational choice), and indicated their feelings about the SIGI system on an attitude questionnaire. The 30 control group students simply received the oral interview.

The results provide some initial support for the use of the SIGI system. The experimental group showed significantly greater and more thorough planning than the control group with respect to the occupational choice process. The experimental group also showed a greater ability to differentiate among the various states of the decision process than did the control group students. Finally, those students who participated in SIGI reported highly favorable attitudes; they thought it was helpful, provided good information and made them more aware of their values.

## Conclusions

The purpose of this paper was to review the research that has used expectancy and decision models to examine occupational choice and to assess the usefulness of such approaches. The empirical results are impressive. Every investigation produced substantial support for the use of such models. While theoretical, mathematical and methodological differences exist among these approaches, they are all based on a fairly similar, rational maximization principle. They assume that people will choose the occupations they believe will result in the greatest amont of benefit to them, provided there is a good chance they can actually attain a position in the occupation.

The results of studies in occupational guidance and counseling are congruent with the foregoing. Providing people with accurate information about jobs and job outcomes facilitates adjustment and reduces turnover. Also, having people engage in a process whereby they explicitly list alternatives, the pros and cons of alternatives, and their importance helps people to consider more alternatives, change their previous evaluations, and reduce their regret (while increasing their commitment) about the choice they actually make.

Everyone makes incorrect decisions in the course of their life. Values and expectations change. What we want today we may scorn tomorrow. Any decision is a gamble based on how we see things at the moment the decision is made. As such, the best we can ever hope for is to reduce the unnecessary risk in such gambles--risk based on murky and erratic use of the information we have. The expectancy and expected value models provide solid, explicit ways in which people might use the information, their values, and expectations about the future in order to make the "best" possible choices. And, in fact, these models seem to be highly predictive.

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## FOOTNOTE

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